

M.Sc. Biochemistry Entrance Examination for the year 2013-14

ELIGIBILITY CRITERIA

1. The candidate should have studied B.Sc. with Biochemistry/Chemistry as a major/ optional.
2. The candidate shall have obtained a minimum of 45% (40% in case of SC/ST and Category I candidates) of marks in cognate/optional subjects put together from all the years of the examination of the course.
3. In case a candidate has taken longer than prescribed duration to pass the qualifying course, a deduction of 3% from the percentage of the aggregate of marks of cognate/optional subjects for every additional year shall be applied and the candidate should have obtained the minimum marks prescribed even after such deduction to become eligible for admission.
4. The candidate seeking admission to M.Sc. Biochemistry shall have to appear for Entrance Examination.
5. The date of the Entrance Examination will be given in the prospectus, will be notified on the Department Notice board and also in the university web site.
6. The Entrance Exam shall be of 1 hr duration with 50 multiple choice questions of 1 mark each. for a maximum of 50 marks.
7. The syllabus for the Entrance exam will be uploaded in the University web site.
8. The results of the Entrance exam will be announced in the Department Notice board and also in the web site.
9. There shall be no provision for revaluation with respect to Entrance exam.
10. Entrance exam fee has to be paid through Demand Draft.
11. Fees paid for the Entrance examination is not refundable.
12. Marks list will be prepared by taking 50% of B.Sc. cognate/optional subject and 50% marks obtained from the Entrance exam.
13. The candidate list – selection list/waiting list will be announced on the Department Notice board and also in the web site.
14. Separate intimation will not be sent to the candidates.

SYLLABUS FOR M.SC. BIOCHEMISTRY
ENTRANCE EXAMINATION FOR THE YEAR 2013-14

UNIT I

BIO-INORGANIC CHEMISTRY & BIO-PHYSICAL CHEMISTRY

BIO-INORGANIC CHEMISTRY

1. Coordination Compounds:

Transition metals, properties (Colour, Oxidation states, Magnetic Properties).

Coordinate bond, double and complex salts – differences with examples. Postulates of Werner's theory. Type of ligands, uni, bi and polydentate with examples. Coordination number.

Porphyrin nucleus and classification. Important metallo porphyrins occurring in nature- structure and their biological importance (Hb, cytochrome, chlorophyll, Vit-B12). Bile pigments chemical nature and their role.

2. Radiochemistry:

Natural and artificial radioactivity. Characteristics of radioactive elements, units of radioactivity, disintegration constant, half life, alpha, beta and gamma radiations. Detection of radioactivity by GM counter. Application of radioisotopes – ^3H , ^{14}C , ^{131}I , ^{60}Co , ^{32}P . Biological effect of radioactivity. Safety measurements in handling radio isotopes.

3. Nitrogen:

Fixation of atmospheric nitrogen – symbiotic and non – symbiotic. Nitrogen cycle, environmental pollution by nitrogen compounds.

4. Phosphorus:

Importance of phosphorus compounds in biological system, phosphorus cycle.

5. Oxygen:

Formation of Ozone in atmosphere. Role of ozone in maintenance of life on earth. Effects of environmental pollutants on ozone layer.

6. Sulphur and Selenium:

Importance of compounds of sulphur and selenium in biological system. Effect of sulphur compounds on environmental pollution.

7. Biochemistry Toxicology:

Toxicity of Lead, Mercury, Cadmium and Arsenic.

BIO-PHYSICAL CHEMISTRY

1. Concentration Units:

Avagadro's number, Mole, Mole fraction, Molarity, Equivalent weight, Normality, Molality (Problems to be worked out)

2. Collegative properties:

Osmotic pressure and its measurement by Berkely-Hartley method. Laws of osmotic pressure, Hypo, Hyper and iostomic solution. effect of osmotic pressure on living cells. Donnan membrane equilibrium. Relative lowering of vapour pressure, Roul't's law. Elevation of boiling point, depression of freezing point and their application in determination of molecular weight. Abnormal molecular weight, Van't Hoff's factor. Degree of association and dissociation.

3. Adsorption:

Freundlich's and Langmuirs adsorption isotherm. Application of adsorption.

4. Viscosity:

Definition, determination of viscosity of liquids and solutions by Ostwald's viscometer(solutions of gum and protein to be taken as examples).

5. Distribution Law:

Distribution law, partition coefficient applications of distribution law.

6. Acid, bases, and buffers:

Lewis concept of acids and bases. Ionic product of water. P^H scale, buffers, Henderson-Hasselbach equation, buffer capacity. Preparation of acid and basic buffer solution. Theory of acid base indicators. Choice of indicators. pH titration curve and isoelectric P^H aminoacids.

7. Electrochemistry:

Specific, equivalent and molar conductance . Reference electrodes(hydrogen electrode and calomel electrode). quinhydrone electrode.glass electrode determination of equivalent conductance of a strong electrolyte. conductrometric titration(strong acid against strong base,weak acid(amino acid)against NaOH) determination of pKa values of weak acids by potentiometric titration.Determination of pH of a buffer by potentiometric method using quinhydrone electrode.

8. Photochemistry:

Law of photochemistry, Quantum efficiency, light absorption, Beer-Lamberts law, spectrophotometer, colorimeter. Fluorescence, phosphorescence, chemiluminescens, bioluminescence(Elementary treatment). Applications of UV-chemiluminescence spectra. Principle of IR spectra and its applications.

UNIT II BIO-ORGANIC- I

1. Introduction to Organic chemistry:

Classification of organic compound, Unique characteristics. IUPAC nomenclature of organic compounds(including bifunctional).

2. Investigation of organic compounds:

Detection and quantitative estimation of element – nitrogen (estimation by Kjeldahl's methods), sulphur, phosphorus and halogens (problems to be solved).

3. Reaction Mechanism:

Concept of inductive effects and resonance. Classification of organic reactions.(substitution addition, elimination and rearrangement),with one example for each. Concepts of the following – carbocations, free radicals, carbenes, nucleophiles and electrophiles.

4. Aliphatic Hydrocarbons:

Dienes – types with examples, 1,3 butadiene, preparation (any one method), stability, mechanism of addition of HBr, Diels – Alder reaction. Mechanism of Markownikoff and anti Markownikoff addition of HBr to propene. Conformational analysis of ethane.

5. Cycloalkanes:

Reactivities and relative stabilities. Bayer's strain theory. Sactise- Mohr theory. Boat and chair forms of cycloalkanes . Axial and equatorial bonds.

6. ARENES

Structure of Benzene-by Resonance and Molecular Orbital Theories. Aromaticity. Mechanism of Nitration and Friedel craft reaction. Electronic interpretation of the orientating influence of substituents in the electrophilic substitution of toluene, chlorobenzene, nitrobenzene, and phenol Polynuclear hydrocarbons - Resonance structure of Naphthalene, Anthracene, Phenanthrene and Diphenyl. Reaction-oxidation and nitration of sulphonation of naphthalene and oxidation of Anthracene.

7. ALKYL HALIDES and Organ metallic Compounds

SN^1 and SN^2 reaction mechanism with one example each. Concept of elimination reaction example – n butyl chloride. Application of organometallic compounds-organo lead,organo lithium, cisplatin.

8. ALCOHOL

Classification. Monohydric alcohols – distinguishing reaction of 1°, 2° and 3° alcohol.

Dihydric alcohol – Glycol, preparation (any 2 method) and uses.

Trihydric alcohol- Glycerol, synthesis from propane, properties (reaction with concentrated H₂SO₄, HNO₃, Oxalic and HI

Ethanols – Acidity of phenols, effects of substitution on acidity

9. STEREOCHEMISTRY

Stereoisomerism, types, Fischer-projection formulae, asymmetric carbon atom, molecular dissymmetry, chirality, optical isomerism example: Glyceraldehydes, Lactic acid and Tartaric acid. Nomenclature of enantiomers. D and L system, R and S system, Racemisation and resolution.

UNIT III

BIOORGANIC II

1. HYDROXY ACID AND DICARBOXYLIC ACID

Structure and properties of :

- Hydroxyl acids: Lactic acid, citric acid and isocitric acid
- Dicarboxylic acid: Maleic and fumaric acid
- Keto acids: Pyruvic, α -ketoglutaric, oxalo-acetic acid

2. AMINES

Classification, properties, amino functional group- Basicity of amines, acylation. Reaction with HNO₂ and Schiff's base formation. Distinguishing reactions of primary, secondary and tertiary amines.

3. HETEROCYCLIC COMPOUNDS

Occurrence, structural formula and importance of Furan, Pyrrole, Thiophene, Pyridine, Pyran, Thiazole, Pyrimidine, Purine, Indole, Imidazole, Quinoline and Isoquinoline.

4. TERPENES

Isoprene rule, classification, structure, occurrence and importance of

- Mono terpenes - Limonene, Menthol and Camphor
- Sesqui terpenes - Santonin, Juvenile Hormone-I and Absciscin -II
- Di terpenes - Phytol
- Triterpenes - Lanosterol
- Tetra terpenes - Lycopine
- Poly terpenes - Dolichols

5. STERIODS

Basic ring system in steroid. Structure and biological importance of Cholesterol, Ergosterol, Bile Acids (Mono, Di, and Tricholic acid) and Ecdysone.

6. ALKALOIDS

Definition, classification based on their biological functions with example. Structure and physiological action of LSD, Morphin, Nicotine, Atropine and Aristolochic Acid.

7. VITAMINS

Classification, water soluble and fat soluble. Structural formula and coenzyme forms of Vitamin B1, B2, B6 and Niacin. Vitamin C as a redox reagent, properties and chemical synthesis. Structural formula of vitamin A,D,E and K.

UNIT IV BIOMOLECULES

CARBOHYDRATES

Carbohydrates-Classification, Biological importance

Monosaccharides: Configuration, relationship of D-Aldoses. General properties of Aldoses and Ketoses-oxidation, reduction, reducing property, formation of glycolipides, acylation, methylation, condensation-phenyl hydrazine, addition-HCN. Interconversion of Aldoses and ketoses by chemical method. Ascending and descending the series by chemical methods. Stereochemistry of Monosaccharides, (+) and(-),D and L, Epimers, Anomers and Diastereoisomers.

Glucose: Elucidation of open chain structure and ring structure of glucose. Conformation of glucose(only structure).Mutarotation. Structure of Galactose, mannose, ribose and fructose. Structure and biological importance of amino sugars, deoxy sugars, sugar acids,neuraminic and muramic acid.

Disaccharides: Establishment of structure of sucrose and lactose. Biological importance and structure of isomaltose, trehalose and maltose.

Polysaccharides: Partial structure, occurrence and importance of starch, glycogen, insulin, cellulose, chitin and pectin.

Glycosaminoglycans: Occurrence, importance and structure of the repeating units of heparin, hyaluronic acid, teichoic acid and chitin sulphate. Bacterial cell wall polysaccharides, peptidoglycans.

Qualitative tests: Molish, Benedict's, Fehling's, picric acid, Barfoed's, Bial's, Selivanoff's, osazone tests.

AMINO ACIDS:

Structure and classification of amino acids based on polarity. Reactions of the amino groups with HNO_2 , LiAlH_4 . Ninhydrin, phenyl isothio cyanate, DANSYL chloride, flurodinitro benzene, Zwitterionic properties, pKa values. Reaction of carboxy group hydrazine. Any method for the chemical synthesis of amino acids. D and L notation.

Peptides:

Peptide bond, structure and biological importance of Glutathione, Valinomycin, Leu-enkaphelin, synthetic peptides-poly glutamic acid, polylysine. Chemical synthesis of di-peptides.

Proteins:

Isolation, methods of purification-dialysis salting out, pH precipitation and solvent precipitation.

Classification of proteins based on solubility, structure and function with examples, colour reactions of proteins-Biuret, Xanthoproteic, Million's.

Primary structure of proteins, methods of determining N- and C- terminal amino acids, amino acid composition, sequencing by Edman's degradation method.

Secondary structure- α -Helix, β -sheet, β -bend. Tertiary and quaternary structure. 3 D structure of Hemoglobin, Denaturation and renaturation of proteins. Anfinsen's experiment.

UNIT V

LIPIDS, NUCLEIC ACIDS & BIOCHEMICAL TECHNIQUES

LIPIDS

Classification and biological role, Fatty acids- Nomenclature of saturated and unsaturated fatty acids. Physical and chemical reactions, esterification, rancidity, essential fatty acids.

Acglycerols: Saponification, saponification value, iodine value, acid value and significance.

Phosphoglycerides: Structure of lecithin, cephalins, phosphotidyl inositol, plasmalogens and cardiolipin, biological role of phosphoglycerides.

Sphingolipids: Structure and importance of sphingomyelin.

Glycosphingo lipids: Structure and importance of gangliosides and cerebroside.

Prostaglandins: Structure of PGE₂ and PGF₂, Biological roles of Thromboxane, Leukotrienes and Prostaglandins.

Plasma lipoproteins: Types and functions.

Biological membrane: Composition of membrane, Fluid mosaic model, functions of the plasma membrane – endocytosis, phagocytosis, membrane receptors and their functions.

NUCLEIC ACIDS:

(a) Isolation of DNA and RNA. Composition of DNA. Nucleosides and Nucleotides.

Chargaff's rule. Watson and Crick model of DNA. Melting of DNA TM.

(b) RNA: composition, types (mRNA, tRNA and rRNA). Secondary structure of tRNA – clover leaf model. Chemical reactions of RNA and DNA with acid and alkali. Color reactions of RNA and DNA.

BIOCHEMICAL TECHNIQUES

General principles and procedures of chromatography – adsorption and partition. Techniques: Paper chromatography – Ascending, descending and circular. 2D chromatography, R_f values, column chromatography, principles and procedures of gel filtration, ion exchange chromatography, affinity chromatography. TLC and their applications. Principles and procedures of electrophoresis, paper and gel electrophoresis.

Centrifugation – Principle of differential centrifugation. Ultra centrifuge – construction and applications.

UNIT VI

ENZYMOLOGY

1. Enzymes:

General characteristics, co-factors, co-enzymes and metal ions. Classification of enzymes based on IUB with examples. Unit of enzyme activity – specific activity, enzyme specificity. Concept of active site.

Theories of enzyme catalysis – Lock and key model, Koshland's induced fit theory.

Enzyme kinetics – Factors affecting rate of enzyme catalyzed reactions.

Effect of substrate concentration, pH, temperature.

Michaelis-Menten equation (Derivation not required). Lineweaver-Burk (L-B) plot. Determination of V_{max} and k_m from L-B plot and their significance.

Allosteric properties – Sigmoidal curve, positive and negative modulators with PFK as an example.

Iso enzymes – detection, nature, importance. LDH as an example.

Multi enzyme complex – pyruvate dehydrogenase complex – composition, subunits, assembly, enzymatic reactions functions.

RNA as an enzyme (Ribozymes)

UNIT VII METABOLISM

1. Metabolism

Anabolism, catabolism, stages. Compartmentalization of metabolic pathways.

2. Bioenergetics:

Laws of thermodynamics, first and second law. Concept of enthalpy, entropy and free energy. Standardized free energy. Endergonic and exergonic reaction. Coupled reactions. High energy compounds – structure of ATP and its free energy change during hydrolysis, other high energy compounds.

3. Biological oxidation:

Ultra structure of mitochondria, Electron Transport Chain, Electron transport complexes. Complex I, II, III and IV. Uncouplers and inhibitors of respiration (Rotenone, Actinomycin D, Cyanide and 2, 4 DNP)

Oxidative phosphorylation, P/O ratio. Formation of ATP- Outline of Mitchell's hypothesis. Substrate-level phosphorylation with examples.

4. Metabolism of Carbohydrates:

Glycogen metabolism- glycogenolysis, glycogen synthesis. Glycolysis, energetic of glycolysis. Entry of other carbohydrates into glycolytic pathway. Fates of Pyruvate-Conversion of Pyruvate to lactate, alcohol and acetyl Co-A.

Citric acid cycle and its energetic. Amphibolic integrating roles of TCA cycle. Anaplerosis. Pentose phosphate pathway and its significance. Cori cycle. Gluconeogenesis.

5. Lipid metabolism:

Oxidation of fatty acid- α , β and ω types. β -oxidation of even number saturated fatty acids. Energetic of β -oxidation.

Biosynthesis of even number fatty acids, Ketonebodies formation. Outline of cholesterol biosynthesis.

6. Metabolism of Amino Acid:

General reaction of amino acid degradation- Transamination, deamination and decarboxylation. Ketogenic and glucogenic amino acids. Urea cycle and its significance.

UNIT VIII

MOLECULAR BIOLOGY, GENETIC ENGINEERING & IMMUNOLOGY

MOLECULAR BIOLOGY

1. Degradation of Nucleic Acid

Degradation of nucleic acid by DNase and RNase and phosphodiesterase. Schematic pathway for degradation of purines and pyrimidines (salvage pathway).

Central dogma of molecular Biology and its modification.

DNA as a genetic material

2. Replication of DNA:

Semi conservative mechanism. Meselson and Stahl experiment. Mechanism of Replication of prokaryotic

3. Prokaryotic RNA Synthesis:

Role of RNA polymerase Initiation, elongation and termination. Reverse transcription.

4. Genetic code:

General features, Wobble hypothesis.

5. Prokaryotic Protein Biosynthesis:

Activation of Amino acids, Amino acyl tRNA synthesis. Initiation, elongation and termination of protein synthesis.

6. Mutations:

Concept of mutation and mutagens- effect of HNO₂, alkylating agents, intercalating agent and UV-radiation. Concept of missense, nonsense, point mutation, frame shift mutation.

7. Concept of gene:

- 1) Gene expression in prokaryotes- concept of Lac operon.
- 2) Functional units in a typical eukaryotic gene-promoters, introns and exons.

GENETIC ENGINEERING

1. Historical development, aim and scope of genetic engineering

2. Isolation of DNA, cutting of DNA by restriction endonuclease- staggered cut and blunt end

3. Outline of Techniques of Genetic Engineering

Cutting genomic DNA, Separation of fragments by agarose gel electrophoresis.

Vector, plasmid: pBR 322, insertion of foreign DNA into Vectors.

Transfection of Vectors into host cells. cDNA principles of polymerase chain reaction and application

4. Blotting Techniques

Principles and procedures of Southern and Northern blotting, Western blotting

5. Applications of Genetic Engineering

- 1) Transgenic plants, transgenic animals and gene therapy
- 2) Human genome project

IMMUNOLOGY

1. Immunity

Cellular and humoral immunity, cellular basis of immunity. Role of immunologically important organs and cells bone marrow, thymus, spleen and lymphocytes. Formation and function of T & B Lymphocytes and macrophages, Helper T-cells and killer T-cells.

2. Antigens

Definition, Haptenes, Epitopes, Antigens, Antigenicity.

3. Antibodies

Definition types and structure of a typical immunoglobulin (IgG-Light chain, heavy chain, hyper-variable region, constant domains, Fab and Fc).

4. Antigen – Antibody reaction in Vitro

Formation of Antigen-Antibody complex. Application of immune diffusion, RIA, ELISA (Basic principles only)

5. Immunization

Vaccination – vaccines and their preparations, Primary and secondary response.

6. Immunological disorders.

Allergy (hyper sensitivity reactions) – Types, AIDS-HIV Virus structure, mode of transmission, mechanism-role of reverse transcriptase, clinical features, diagnosis, treatment.

UNIT IX

HUMAN PHYSIOLOGY AND CLINICAL BIOCHEMISTRY

HUMAN PHYSIOLOGY

1. Neurotransmission:

Type of neurons generalized structure of multipolar neuron. Resting membrane potential. Action potential, transmission of a nerve impulse along an axon and across a synapse. Neurotransmitters, Inhibitors of neuro transmitters.

2. Muscle:

Types of muscles and their structure. Ultrastructure of skeletal muscle. Contractile and regulatory proteins of muscle, sliding filament model of skeletal muscle contraction.

3. Bone:

Composition and structure of long bone, growth and remodeling of long bone. Factors affecting its growth.

4. Excretory system:

Structure of the Nephron, formation of urine-glomerular filtration, tubular reabsorption and secretions.

5. Body Fluids:

Blood volume, composition and function. RBC, WBC and platelets, their structure functions. Mechanism of blood coagulation. Biochemical events in transport of CO₂ and O₂ in blood. Cerebrospinal fluid, lymph and its function. Blood brain barrier.

6. Acid base balance:

Maintenance of normal pH of the body fluids. Blood buffers. Role of lungs and kidney in acid-base balance.

7. Endocrine system:

Endocrine organs, classification of hormones, Hierarchy, interplay and dynamic balance and regulation of hormone secretions.

General mechanism of steroid hormone action. Mechanism of hormone action concept of second messengers. Examples: cAMP, DAG, IP₃, G-Protein.

8. Liver:

Structure of lobules functions – metabolic storage and detoxification.

CLINICAL BIOCHEMISTRY

1. Urine:

Normal composition of urine – volume, pH, colour, specific gravity. Constituents ; urea , uric acid, creatinine, pigments, abnormal constituents – glucose, albumin, ketone bodies, variations in urea, creatinine, pigments and their clinical significances in brief.

2. Blood:

Normal constituents of blood and their variation in pathological conditions – urea, uric acid creatinine, glucose, bilirubin, Total protein, Albumin/Globulin ratio, Lipid profile – cholesterol, triglycerides, lipoproteins HDL and LDL.

3. Liver function Tests:

Alkaline phosphatase, SGOT and SGPT
Cardiac injury profule CPK and LDH

4. Inborn errors of Metabolism

Sickle cell anemia, phenyl ketonuria, Nieman-pick disease.

UNIT X NUTRITION AND MICROBIOLOGY

NUTRITION

1. Introduction

Concept of nutrition, calorific value of foods and its determination (Bomb calorimeter) different components of energy expenditure respiratory quotient, Basal Metabolic Rate (BMR) determination of BMR, factors affecting BMR, specific dynamic action of food. Energy expenditure at rest and work.

2. Carbohydrates

Dietary sources, dietary fibres and protein sparing action.

3. Proteins

Dietary sources, nutritional classification, nutritional value of proteins – PER, NPU and Biological value of proteins (BV). Essential amino acids. Nitrogen balance mutual supplementation of proteins, Malnutrition- Kwashiorkar and marasmus.

4. Fats

Dietary sources of fats, invisible fat, essential fattyacids and their biological importance.

5. Vitamins

Dietary sources, requirements, deficiency symptoms and biological role of water soluble vitamins – Thiamine, Riboflavin, Niacin, Pantothenic acid, Pyridoxine, Biotin, Folic acid, Vit.B12 and Vitamin C.

Fat soluble vitamins – Vitamin A,D,E and K.

Hypervitaminosis

6. Minerals

Mineral metabolism of Ca, P, Fe, Zn, Cu, I

7. Water metabolism:

Distribution of water in body fluids. Factors influencing water metabolism.

8. Antinutritional factors.

Sources and harmful effects of anti vitamins (Eg. Avidin, dicoumarol) Natural toxicants (Eg. Lathyrus sativa) and adulterants (Eg. Butter yellow, lead chromate, malachite green)

9. Digestion absorption and transport of carbohydrates proteins and fats. GI tract, secretions, composition and function of saliva, gastric, bile, pancreatic and intestinal juices. Appetite, gastrointestinal hormones.

MICROBIOLOGY

1. Study of Microorganisms:

Staining microorganisms – Principle and procedure of gram stain, acid fast stain .

2. Microbial nutrition:

Growth of microorganisms, measurement of growth factors influencing growth-nutrition, carbon source, nitrogen source. Temperature, pH and oxygen. Growth curve, phases of growth curve.

3. Industrial Microbiology:

Production and importance – Alcoholic beverage (Beer and Wine), Fermented products of milk, cheese, antibiotic production – penicillin, single cell protein – spirulina.

4. Antibiotics:

Definition, Mechanism of action of penicillin, streptomycin and chloramphenicol, antibiotic resistance in brief.

5. Viruses

Classification based on genetic material with examples. Plant viruses – TMV. Morphology, General characteristics and its replication.

6. Bacteriophages:

Morphology and general characteristics life cycle (Lysogeny and lytic cycle) of T even bacteriophages.

PRACTICALS

Bio-inorganic Chemistry practical-1

1. Use of analytical balance and weighing.
2. Calibration, preparation of normal, Molar solution.
3. Preparation of standard sodium carbonate solution. Standardization of HO (Methyl orange) and estimation of NaOH in the given solution (methyl orange or phenolphthalein).
4. Calibration of volumetric glasswares.
5. Preparation of standard oxalic acid. Standardization of NaOH and estimation of H₂SO₄ in the given solution (phenolphthalein).
6. Preparation of standard oxalic acid. Standardization of KMnO₄ and estimation of H₂O₂ in the given solution.
7. Preparation of standard K₂Cr₂O₇. Standardization of Na₂S₂O₂ and estimation of CuSO₄ in the given solution.
8. Preparation of standard K₂Cr₂O₇. Estimation of ferrous (Fe²⁺)/ferric(Fe³⁺) ions in a mixture using diphenylamine indicator.
9. Preparation of ZnSO₄, standardization of EDTA and estimation of total hardness of water using Erichrome black-T indicator.
10. Preparation of standard potassium biphthalate . standardization of NaOH and estimation of HCl in the given solution(phenolphthalein).

PRACTICALS

Analysis of the following organic compounds;

Urea, Benzamide, Benzaldehyde, Aniline, Acetophenone, O-Cresol, Nitrobenzene, Chlorobenzene, naphthalene, Toluidine, Benzoic acid, Salicylic acid, Resorcinol, Benzyl alcohol, p-dichlorobenzene

PRACTICALS

ORGANIC PREPARATIONS

Preparation of

- a) Benzoic acid from benzaldehyde or toluene
- b) Meta dinitrobenzene from nitrobenzene
- c) Aspirin from salicylic acid
- d) Tribromophenol from phenol
- e) P-Bromo acetanilide from acetanilide
- f) Extraction of caffeine from tea leaves
- g) Extraction of starch from potatoes
- h) Extraction of casein from milk
- i) Extraction of oil from oil seeds

Qualitative tests for ribose, deoxy ribose, mono, di and polysaccharides

PRACTICALS

PART-A (Biomolecules)

1. Qualitative analysis of Biomolecules

- i) Carbohydrate – Glucose, Fructose, Lactose, Maltose and Sucrose.
- ii) Amino acids and proteins – Arginine, Tryptophan, Tyrosine, Cystein, Albumin and Casein.
- iii) Nucleic acid – qualitative test for ribose and deoxy ribose.
- iv) Lipids – Iodine value, saponification value, acid value.

2. Colorimetric estimation of

- i) Glucose by DNA method
- ii) Protein by Biuret method
- iii) Protein by Lowry's method
- iv) Uric acid
- v) Urea by DAMO method
- vi) Creatinine by Jaffe's method
- vii) Phosphorus by Fiske and Subbarow's method.
- viii) Ferric iron by Thiocyanate method.

PART-B (Enzyme Assays)

1. Salivary Amylase

- a) Determination of specific activity by DNS
- b) Determination of pH optimum
- c) Determination of K_m and V_{max}
- d) Determination of initial velocity (time kinetics)
- e) Determination of optimum temperature and energy of activation

PRACTICALS

Bio-chemistry of Nutrition and Human Physiology

1. Determination of
 - a. Moisture content of foods.
 - b. Adulterants in foods
 - c. Calcium in Ragi.
 - d. Iron in Drumsticks
2. Estimation of vitamin-C in lemon and gooseberries
3. Gravimetric estimation sulphate.
4. Qualitative analysis of urine-detection of urea, uric acid and creatinine
5. Qualitative analysis of abnormal constituents in urine-glucose, albumine, bile pigments, bile salts and ketone bodies.

6. Determination of titrable acidity of urine.
7. Estimation of reducing sugars by Hegedon and Jensen method
8. Estimation of amino acid by formal titration
9. Determination of saponification value of oil or fat
10. Determination of iodine value of oil or fat.

PART – B

Bio-Physical – II Microbiology

1. Determination of equivalent – conductance of strong electrolyte by wheat stones bridge (Kohlrainnsch's bridge).
2. conductometric titration of strong acid against strong base.
3. Preparation of acidic and basic buffers and determination pH using pH meter
4. Determinatio of Pka value of amino acid by using pH meter or potentio meter.
5. Determination of ph of a buffer solution by potentio metric method using quinhydrone electrode.
6. Gram staining.
7. Growing microbes from soil and sewage water.
8. Demonstration of western blotting.
9. Extraction and estimation of DNA from coconut endosperm.
10. Extraction and estimation of RNA from spinach leaves.